

# SEQUENCE LISTING

<110> Allen, Stephen M.  
Rafalski, J. Antoni  
Sakai, Hajime

<120> Nitrogen Transport Metabolism

<130> BB-1210

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<150> 60/098,248

<151> 28 August 1998

<160> 14

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<211> 1037

<212> DNA

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<212> PRT

<213> Zea mays

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50 55 60

Phe Ala Arg Arg Lys Tyr Val Glu Glu Ile Tyr Gly Ala Gly Arg Pro  
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Tyr Gly Leu Phe Met Gly Gly Gly Gly Lys Leu Leu Ala Ala Gln Ile  
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Ile Gln Ile Leu Val Ile Ala Gly Trp Val Ser Cys Thr Met Gly Pro  
100 105 110

Leu Phe Tyr Ala Leu Lys Lys Leu Gly Leu Leu Arg Ile Ser Ala Asp  
115 120 125

Asp Glu Met Ser Gly Met Asp Leu Thr Arg His Gly Gly Phe Ala Tyr  
130 135 140

Val Tyr His Asp Glu Asp Pro Gly Asp Lys Ala Gly Val Gly Gly Phe  
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Ala Ala Thr Ser Ser Gln Val  
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<212> DNA  
<213> Glycine max

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 <211> 500  
 <212> PRT  
 <213> Glycine max

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 Phe Ala Ala Val Asp Ser Lys Phe Val Asp Thr Ala Phe Ala Val Asp  
 35 40 45  
 Asn Thr Tyr Leu Leu Phe Ser Ala Tyr Leu Val Phe Ser Met Gln Leu  
 50 55 60  
 Gly Phe Ala Met Leu Cys Ala Gly Ser Val Arg Ala Lys Asn Thr Met  
 65 70 75 80  
 Asn Ile Met Leu Thr Asn Val Leu Asp Ala Ala Gly Gly Leu Phe  
 85 90 95  
 Tyr Tyr Leu Phe Gly Phe Ala Phe Ala Phe Gly Ser Pro Ser Asn Gly  
 100 105 110  
 Phe Ile Gly Lys His Phe Phe Gly Leu Lys Asp Ile Pro Ser Ser Ser  
 115 120 125  
 Tyr Asp Tyr Ser Tyr Phe Leu Tyr Gln Trp Ala Phe Ala Ile Ala Ala  
 130 135 140  
 Ala Gly Ile Thr Ser Gly Ser Ile Ala Glu Arg Thr Gln Phe Val Ala  
 145 150 155 160  
 Tyr Leu Ile Tyr Ser Ser Phe Leu Thr Gly Phe Val Tyr Pro Val Val  
 165 170 175  
 Ser His Trp Phe Trp Ser Pro Asp Gly Trp Ala Ser Ala Phe Lys Ile  
 180 185 190  
 Thr Asp Arg Leu Phe Ser Thr Gly Val Ile Asp Phe Ala Gly Ser Gly  
 195 200 205  
 Val Val His Met Val Gly Gly Ile Ala Gly Leu Trp Gly Ala Leu Ile  
 210 215 220  
 Glu Gly Pro Arg Met Gly Arg Phe Asp His Ala Gly Arg Ala Val Ala  
 225 230 235 240  
 Leu Arg Gly His Ser Ala Ser Leu Val Val Leu Gly Thr Phe Leu Leu  
 245 250 255  
 Trp Phe Gly Trp Tyr Gly Phe Asn Pro Gly Ser Phe Asn Lys Ile Leu  
 260 265 270

Leu Thr Tyr Gly Asn Ser Gly Asn Tyr Tyr Gly Gln Trp Ser Ala Val  
 275 280 285  
 Gly Arg Thr Ala Val Thr Thr Thr Leu Ala Gly Ser Thr Ala Ala Leu  
 290 295 300  
 Thr Thr Leu Phe Gly Lys Arg Val Ile Ser Gly His Trp Asn Val Thr  
 305 310 315 320  
 Asp Val Cys Asn Gly Leu Leu Gly Gly Phe Ala Ala Ile Thr Ala Gly  
 325 330 335  
 Cys Ser Val Val Glu Pro Trp Ala Ala Ile Val Cys Gly Phe Val Ala  
 340 345 350  
 Ser Ile Val Leu Ile Ala Cys Asn Lys Leu Ala Glu Lys Val Lys Phe  
 355 360 365  
 Asp Asp Pro Leu Glu Ala Ala Gln Leu His Gly Gly Cys Gly Thr Trp  
 370 375 380  
 Gly Val Ile Phe Thr Ala Leu Phe Ala Lys Lys Glu Tyr Val Lys Glu  
 385 390 395 400  
 Val Tyr Gly Leu Gly Arg Ala His Gly Leu Leu Met Gly Gly Gly Gly  
 405 410 415  
 Lys Leu Leu Ala Ala His Val Ile Gln Ile Leu Val Ile Ala Gly Trp  
 420 425 430  
 Val Ser Ala Thr Met Gly Pro Leu Phe Trp Gly Leu Asn Lys Leu Lys  
 435 440 445  
 Leu Leu Arg Ile Ser Ser Glu Asp Glu Leu Ala Gly Met Asp Met Thr  
 450 455 460  
 Arg His Gly Gly Phe Ala Tyr Ala Tyr Glu Asp Asp Glu Thr His Lys  
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 His Gly Met Gln Leu Arg Arg Val Gly Pro Asn Ala Ser Ser Thr Pro  
 485 490 495  
 Thr Thr Asp Glu  
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 <212> DNA  
 <213> Triticum aestivum

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 aaaaaaaaaa a 1991

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 <212> PRT  
 <213> *Triticum aestivum*

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 35 40 45  
 Ala Met Gln Leu Gly Phe Ala Met Leu Cys Ala Gly Ser Val Arg Ala  
 50 55 60  
 Lys Asn Thr Met Asn Ile Met Leu Thr Asn Val Leu Asp Ala Ala Ala  
 65 70 75 80  
 Gly Ala Leu Phe Tyr Tyr Leu Phe Gly Phe Ala Phe Ala Phe Gly Thr  
 85 90 95  
 Pro Ser Asn Gly Phe Ile Gly Lys His Phe Phe Gly Leu Lys Asp Met  
 100 105 110  
 Pro Gln Thr Gly Phe Asp Tyr Ser Phe Phe Leu Phe Gln Trp Ala Phe  
 115 120 125  
 Ala Ile Ala Ala Ala Gly Ile Thr Ser Gly Ser Ile Ala Glu Arg Thr  
 130 135 140

Gln Phe Val Ala Tyr Leu Ile Tyr Ser Ala Phe Leu Thr Gly Phe Val  
145 150 155 160

Tyr Pro Val Val Ser His Trp Ile Trp Ser Val Asp Gly Trp Ala Ser  
165 170 175

Ala Ala Arg Thr Ser Gly Pro Leu Leu Phe Lys Ser Gly Val Ile Asp  
180 185 190

Phe Ala Gly Ser Gly Val Val His Met Val Gly Gly Ile Ala Gly Phe  
195 200 205

Trp Gly Ala Leu Ile Glu Gly Pro Arg Ile Gly Arg Phe Asp His Ala  
210 215 220

Gly Arg Ser Val Ala Leu Lys Gly His Ser Ala Ser Leu Val Val Leu  
225 230 235 240

Gly Thr Phe Leu Leu Trp Phe Gly Trp Tyr Gly Phe Asn Pro Gly Ser  
245 250 255

Phe Val Thr Ile Leu Lys Ser Tyr Gly Pro Pro Gly Ser Ile Asn Gly  
260 265 270

Gln Trp Ser Gly Val Gly Arg Thr Ala Val Thr Thr Thr Leu Ala Gly  
275 280 285

Ser Val Ala Ala Leu Thr Thr Leu Phe Gly Lys Arg Leu Gln Thr Gly  
290 295 300

His Trp Asn Val Val Asp Val Cys Asn Gly Leu Leu Gly Gly Phe Ala  
305 310 315 320

Ala Ile Thr Ala Gly Cys Ser Val Val Asp Pro Trp Ala Ala Val Ile  
325 330 335

Cys Gly Phe Val Ser Ala Trp Val Leu Ile Gly Leu Asn Ala Leu Ala  
340 345 350

Gly Arg Leu Lys Tyr Asp Asp Pro Leu Glu Ala Ala Gln Leu His Gly  
355 360 365

Gly Cys Gly Ala Trp Gly Ile Ile Phe Thr Ala Leu Phe Ala Lys Lys  
370 375 380

Gln Tyr Val Glu Glu Ile Tyr Gly Ala Gly Arg Pro Tyr Gly Leu Phe  
385 390 395 400

Leu Gly Gly Gly Gly Arg Leu Leu Ala Ala His Ile Val Gln Ile Leu  
405 410 415

Val Ile Ala Gly Phe Val Ser Cys Thr Met Gly Pro Leu Phe Leu Ala  
420 425 430

Leu Lys Lys Leu Gly Leu Leu Arg Ile Ser Ala Glu Asp Glu Met Ala  
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Gly Met Asp Leu Thr Arg His Gly Gly Phe Ala Tyr Val Tyr His Asp  
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1003103.422604

Asp Asp Glu His Asp Lys Ser Val Gly Gly Phe Met Leu Arg Ser Ala  
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Gln Thr Arg Val Glu Pro Ala Ala Ala Ala Asn Ser Gln Val  
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<213> Zea mays

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<212> PRT  
<213> Zea mays

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Gln Ser Phe Pro Gly Leu Val Leu Tyr Gly Gly Val Val Lys Lys  
 35 40 45

Lys Trp Ala Val Asn Ser Ala Phe Met Ala Leu Tyr Ala Phe Ala  
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 <212> DNA  
 <213> Oryza sativa

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 <211> 497  
 <212> PRT  
 <213> Oryza sativa

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 20 25 30



Ala Thr Phe Val Gly Leu Gln Ser Met Pro Gly Leu Val Val Leu Tyr  
35 40 45

Gly Ser Ile Val Lys Lys Lys Trp Ala Val Asn Ser Ala Phe Met Ala  
50 55 60

Leu Tyr Ala Tyr Ala Ser Thr Leu Ile Val Trp Val Leu Val Gly Phe  
65 70 75 80

Arg Met Ala Phe Gly Asp Arg Leu Leu Pro Phe Trp Gly Lys Ala Gly  
85 90 95

Ala Ala Leu Thr Glu Gly Phe Leu Val Ala Arg Ala Ser Val Pro Ala  
100 105 110

Thr Ala His Tyr Gly Lys Asp Gly Ala Leu Glu Ser Pro Arg Thr Glu  
115 120 125

Pro Phe Tyr Pro Glu Ala Ser Met Val Leu Phe Gln Phe Glu Leu Ala  
130 135 140

Ala Ile Thr Leu Val Leu Leu Ala Gly Ser Leu Leu Gly Arg Met Asn  
145 150 155 160

Ile Lys Ala Trp Met Ala Phe Thr Pro Leu Trp Leu Leu Phe Ser Tyr  
165 170 175

Thr Val Cys Ala Phe Ser Leu Trp Gly Gly Phe Leu Tyr Gln Trp  
180 185 190

Gly Val Ile Asp Tyr Ser Gly Gly Tyr Val Ile His Leu Ser Ser Gly  
195 200 205

Ile Ala Gly Phe Thr Ala Ala Tyr Trp Val Gly Pro Arg Leu Lys Ser  
210 215 220

Asp Arg Glu Arg Phe Ser Pro Asn Asn Ile Leu Leu Met Ile Ala Gly  
225 230 235 240

Gly Gly Leu Leu Trp Leu Gly Trp Ala Gly Phe Asn Gly Gly Ala Pro  
245 250 255

Tyr Ala Pro Asn Ile Thr Ala Ser Ile Ala Val Leu Asn Thr Asn Val  
260 265 270

Ser Ala Ala Ala Ser Leu Leu Thr Trp Thr Cys Leu Asp Val Ile Phe  
275 280 285

Phe Gly Lys Pro Ser Val Ile Gly Ala Val Gln Gly Met Met Thr Gly  
290 295 300

Leu Val Cys Ile Thr Pro Gly Ala Gly Leu Val His Thr Trp Ala Ala  
305 310 315 320

Ile Leu Met Gly Ile Cys Gly Gly Ser Leu Pro Trp Phe Ser Met Met  
325 330 335

Ile Leu His Lys Arg Ser Ala Leu Leu Gln Lys Val Asp Asp Thr Leu  
340 345 350

Ala Val Phe His Thr His Ala Val Ala Gly Leu Leu Gly Gly Phe Leu  
 355 360 365

Thr Gly Leu Phe Ala Leu Pro Asp Leu Thr Ala Val His Thr His Ile  
 370 375 380

Pro Gly Ala Arg Gly Ala Phe Tyr Gly Gly Gly Ile Ala Gln Val Gly  
 385 390 395 400

Lys Gln Ile Ala Gly Ala Leu Phe Val Val Val Trp Asn Val Val Ala  
 405 410 415

Thr Thr Val Ile Leu Leu Gly Val Gly Leu Val Val Pro Leu Arg Met  
 420 425 430

Pro Asp Glu Gln Leu Lys Ile Gly Asp Asp Ala Ala His Gly Glu Glu  
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Ala Tyr Ala Leu Trp Gly Asp Gly Glu Arg Phe Asp Val Thr Arg His  
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Glu Gly Ala Arg Gly Gly Ala Trp Gly Ala Ala Val Val Asp Glu Ala  
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Val Gly Leu Gln Ser Met Pro Gly Leu Val Ile Leu Tyr Ala Ser Ile
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Val Lys Lys Lys Trp Ala Val Asn Ser Ala Phe Met Ala Leu Tyr Ala
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Phe Ala Ala Val Leu Ile Cys Trp Val Leu Val Cys Tyr Arg Met Ala
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Phe Gly Glu Glu Leu Phe Pro Phe Trp Gly Lys Gly Ala Pro Ala Leu
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Gly Gln Lys Phe Leu Thr Lys Arg Ala Ile Val Ile Glu Thr Ile His
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His Phe Asp Asn Gly Thr Val Glu Ser Pro Pro Glu Glu Pro Phe Tyr
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Pro Met Ala Ser Leu Val Tyr Phe Gln Phe Thr Phe Ala Ala Ile Thr
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Leu Ile Leu Leu Ala Gly Ser Val Leu Gly Arg Met Asn Ile Lys Ala
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Trp Met Ala Phe Val Pro Leu Trp Leu Ile Phe Ser Tyr Thr Val Gly
      165            170            175

Ala Phe Ser Leu Trp Gly Gly Gly Phe Leu Tyr Gln Trp Gly Val Ile
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Asp Tyr Ser Gly Gly Tyr Val Ile His Leu Ser Ser Gly Ile Ala Gly
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Phe Thr Ala Ala Tyr Trp Val Gly Pro Arg Leu Lys Ser Asp Arg Glu
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 35 40 45  
 Val Val Lys Lys Lys Trp Ala Val Asn Ser Ala Phe Met Ala Leu Tyr  
 50 55 60  
 Ala Phe Ala Ala Val Trp Ile Cys Trp Val Val Trp Ala Tyr Asn Met  
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 Ser Phe Gly Glu Glu Leu Leu Pro Phe Trp Gly Lys Ala Gly Pro Ala  
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 Leu Asp Gln Ala Phe Leu Val Gly Arg Ala Ser Leu Pro Ala Thr Ala  
 100 105 110  
 His Tyr Arg Ala Asp Gly Thr Leu Glu Thr Ala Met Val Glu Pro Tyr  
 115 120 125  
 Phe Pro Met Ala Thr Val Val Tyr Phe Gln Cys Val Phe Ala Ala Ile  
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Ala Trp Met Leu Phe Val Pro Leu Trp Leu Thr Phe Ser Tyr Thr Val  
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Gly Ala Phe Ser Val Trp Gly Gly Gly Phe Leu Phe His Trp Gly Val  
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Ile Asp Tyr Cys Gly Gly Tyr Val Ile His Ile Pro Ala Gly Val Ala  
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Gly Phe Thr Ala Ala Tyr Trp Val Gly Pro Arg Thr Lys Lys Asp Arg  
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Glu Ser Phe Pro Pro Asn Asn Ile Leu Phe Ala Leu Thr Gly Ala Gly  
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Leu Leu Trp Met Gly Trp Ala Gly Phe Asn Gly Gly Gly Pro Tyr Ala  
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Ala Ala Ser Leu Ile Val Trp Thr Cys Leu Asp Ala Val Phe Phe Lys  
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Lys Pro Ser Val Val Gly Ala Val Gln Ala Val Ile Thr Gly Leu Val  
290 295 300

Cys Ile Thr Pro Gly Ala Gly Val Val Gln Gly Trp Ala Ala Leu Val  
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Met Gly Val Leu Ala Gly Ser Val Pro Trp Tyr Thr Met Met Val Leu  
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His Lys Arg Ser Lys Leu Leu Gln Arg Val Asp Asp Thr Leu Gly Val  
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Ile His Thr His Gly Val Ala Gly Leu Leu Gly Gly Val Leu Thr Gly  
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370 375 380

Ser Arg Gly Ala Phe Tyr Gly Gly Asn Gly Gly Ala Gln Leu Gly Lys  
385 390 395 400

Gln Ile Ala Gly Ala Leu Phe Val Ile Gly Trp Asn Val Val Val Thr  
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Ser Ile Ile Cys Val Val Ile Arg Leu Val Val Pro Leu Arg Met Ser  
420 425 430

Glu Glu Lys Leu Ala Ile Gly Asp Asp Ala Val His Gly Glu Glu Ala  
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Tyr Ala Leu Trp Gly Asp Gly Glu His Tyr Asp Asp Thr Lys His Gly  
450 455 460

